Math 8143: Mathematics for Elementary School Teachers I

Credit hours: **4 credit hours**
Prerequisites: **Math 0100 with a grade of C or better**

Course Description

Math 1143 is designed for students who plan to major in elementary education and ultimately become teachers in the PK-8 system. Topics will include sets, numbers and numeration, whole number computation, basic number theory, integers, fractions and rational numbers, decimals, and proportions. The focus in this class is on developing a deeper understanding as to why the operations in arithmetic work as they do, and using these operations to develop algorithms and models for use in problem solving. This class should not be seen as a simple review of foundational mathematics. Students will be expected to make reasoned and rigorous mathematical arguments with a strong emphasis on communicating mathematical ideas in written and verbal form. This class is equivalent to Math 143 at RIC.

Course Objectives

1. Provide students with a thorough and rigorous foundation in arithmetic operations and problem solving
2. Achieve a deeper and more meaningful understanding of the underlying structure of elementary mathematics
3. Learn to communicate the nuance of mathematics to an elementary level audience

Learning Outcomes

1. Perform arithmetic operations with whole numbers, integers, fractions and decimals
2. Use arithmetic operations to build models which may be used to solve real world problems
3. Understand and recognize patterns
4. Utilize patterns to develop algorithms, solve problems and make extrapolations about future scenarios
5. Understand sets and set operations
6. Develop an understanding of how mathematical principals can be generalized by using basic set theory
7. Use set operations to solve problems involving the interpretation of surveys
8. Create rigorous written arguments to explain why fundamental arithmetic operations work as they do
9. Separate word problems into small parts and explain in written or verbal form how to put everything together and arrive at a meaningful solution
10. Clearly explain, in written or verbal form, how the mathematical operations are defined and how they may be used to solve problems
11. Link various concepts together and extrapolate these results to solve other types of problems

Course Topics

I. SETS
   A. Set basics
   B. Visualizing sets and Venn diagrams
   C. Set operations
   D. Using sets as a problem solving tool

II. NUMBERS AND NUMERATION
   A. History of numeration
   B. The Hindu-Arabic or decimal system

C. Other base numeration systems

III. WHOLE NUMBER COMPUTATION
- A. Understanding whole number operations
  1. Addition
  2. Subtraction
  3. Multiplication
  4. Division
- B. Adding and subtracting large numbers
- C. Multiplying and dividing large numbers
- D. The two approaches to division

IV. BASIC NUMBER THEORY
- A. Divisibility
  1. Prime numbers
  2. Composite numbers
- B. Greatest common factors
- C. Least common multiples

V. INTEGERS
- A. Basic properties
  1. The real number line
  2. Opposites
  3. Absolute value
- B. Addition and subtraction of integers
- C. Multiplication and division of integers

VI. FRACTIONS AND RATIONAL NUMBERS
- A. Fractions and the set of rational numbers
- B. Adding and subtracting rational numbers
- C. Multiplying and dividing rational numbers

VII. DECIMALS, REAL NUMBERS AND PROPORTIONAL REASONING
- A. Decimals and the real numbers
- B. Operations with decimals and real numbers
- C. Percentages
- D. Proportional reasoning